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The conservation of water and soil from an aricultural standpoint is largely a matter of soil and plant management. A good farmer with a knowledge of the character and deterioration of his soil, with an understanding of the effect of slope upon erosion, with proper manipulation of his soil, with a familiarity with the relationship to erosion of the various crops he raises, with well planned tillage practices, and with an intelligent subdivision and logical use of all parts of his farm can keep his losses from erosion at a minimum. Obviously, the farmer living in a gently rolling region finds that problem in its simplest form. With a departure from these regions of moderate slopes, however, the problem becomes increasingly serious with steeper slopes as the major factor, until in such regions as southeastern Ohio a farmer finds that an entirely different farm management plan is necessary.

He must farm on the contour instead of parallel to land subdivision lines; he must plan his rotation through strip farming at right angles to the slopes. He learns, too, that he must completely exclude from rotation many parts of his farm where an attempt to produce row crops of grain would lead to the complete loss of the top soil. He must, therefore, use some tracts as permanent pasture. In many cases, due to very steep slopes and highly erosive soils, he learns that grazing results in sufficient disturbance to cause serious erosion; he is, therefore, obliged to retire his steepest land from all agricultural use.

In the Salt Creek Watershed, a representative farming region in unglaciated hill land, loams and clay loams largely derived from sandstone, shale, and limestone are the predominating soils. Rolling to rugged topography is the rule with narrow valleys and broad uplands separated by slopes that frequently are steep. These slopes vary in length from a few to several hundred yards, but are quite generally steep, especially near the tops. In addition to the lowlands and uplands all too

many of the intervening slopes have been used for crop production. While the lower part of these slopes is frequently suitable for use as crop and meadow land, the upper parts are typically steeper and cannot safely be used for these purposes as is glaringly exemplified by the universal sheet and gully erosion that is found on these upper slopes. The woods which cover about 12 per cent of the average farm usually occupy these steep upper slopes. This cover gradually gives way to pasture below. It is frequently noted, however, that this transition occurs very high on the slopes leaving too much of the steeper land in pasture. Along with their prevalent non-conservative land use there has been very little contour cultivation of land; only an occasional farmer has done any strip

Fences are moved down the slope as indicated by dotted line.

cropping. Overgrazing of steep pastures has been the rule, and very few farm woods have been spared from abuse and, in many cases, destruction by livestock. As the raising of cattle and sheep is one of the major activities on southeastern Ohio farms, the grazing of practically all parts of the farm has been common practice. Thus, an analysis of the land use situation reveals chiefly that too much of the upper slope land is in pasture. The object, then, of the Soil Erosion Service, in so far as land use is concerned, is to move fences farther down the slopes which results in the steeper crop land going into meadow or pasture, and the steeper pasture land into forest use. The forestry division of the Soil Erosion Service is charged with the responsibility of demonstrating practical means of

establishing and maintaining good forest cover on the already existing woodlands and the additional steep pasture land that has been reclassified for forestry use in the future.

In so far as present conditions of the woods are concerned, the one most apparent fact is that the majority of them have been grazed by both cattle and sheep. This has led to the loss of all understory; leaf litter is lacking, and dead and dying trees are commonly noted. In most cases sheet erosion has become serious and has advanced to such a stage that all soil cover has been removed and frequently all the top soil also. In harvesting timber crops, clear cutting has been the prevailing practice, which all too often is followed by fire, leaving the ground stripped of all protective cover. Very few farm woods have been managed with a thought for the maintenance of a good forest cover at all times. An occasional farmer has been adhering to a practice of cutting only mature timber in his woods, thereby maintaining, to a certain extent, sustained yield production. Practically no attempts have been made to weed, thin out, and generally improve growing conditions. As a consequence, trees of no value have commonly become dominant, and crooked, injured, diseased, and otherwise valueless trees are prevalent. This all means that the yield of timber is low in both quality and quantity. The general condition then of the average farm woods in the Salt Creek Watershed is poor from both the standpoint of soil erosion control and the production of timber and other benefits.

The additional land that is being retired from all agricultural use and reclassified as future forest land in accordance with the new reorganized plan of the individual farms is universally sheet eroded until the top soil is all gone. The typical cover on these areas consists of a usually scanty growth of poverty grass and various vines. In many places no cover is present, but instead the parent soil material of shale or sandstone and shale is exposed. Vegetative cover must be re-established and this obviously presents quite a problem.

From an erosion standpoint it is recognized that the objective is to establish, maintain, and perpetuate on these woodlands a cover that will bring about that typical soil porosity which is so essential in the absorption of water and at the same time in the stimulation of the maximum production of forest products and other benefits. While it is true that, in carrying out a program such as this, the control of soil erosion should be considered the major objective, it is agreed that, in dealing with the average farmer who is deriving all his income from the land, economics considerations must be kept in the foreground.

The work of the Forestry Division of the Soil Erosion Service is being conducted under the following projects:

1. Surveys
   a. Forest Planting
   b. Woods
2. Forest Planting
   a. Gully planting
   b. Field planting
   c. Nursery
3. Farm Woods Management
   a. Woods improvement—weeding, thinning, sanitation cutting, etc.
   b. Methods of harvesting timber—"selection cutting"
   c. Utilization and marketing of farm timber
      (1) Timber estimating and scaling
      (2) Logging
      (3) Home use
      (4) Sale of timber
   d. Protection of farm woods
      (1) Fencing of woods
      (2) Fire control
4. Studies and Observations
   a. At Timber Plot, Soil Erosion Experiment Farm
      (1) Water run-off and erosion
      (2) Penetration of water
      (3) Freezing of forest soil
   b. Study of past plantings
      (1) Survival
      (2) Growth
      (3) Natural protection
5. Educational work
   a. Demonstrations
   b. Talks
   c. Articles
   d. Circulars

Surveys are being made to get basic information for the intelligent formulation of plans. The aim in the woods surveys is to cover enough well distributed representative areas to accumulate sufficient information on which to base management recommendations to the owners. Strip surveys thus far indicate a universal lack of understory of reproduction which is necessary for the perpetuation of the stands and the conservation of moisture. Along with this condition there is little or no litter accumulation in most woods. It is only logical then to find timber of slow growth and low volume per acre.

Planting surveys are being made on all farms under contract in order to secure necessary information to enable the foresters to intelligently make planting plans.

The forest planting project is probably receiving more attention at present than any other. A policy of planting only where there appears to be little chance of early natural reproduction is being strictly adhered to. Bearing in mind that this is a hardwood region, plans call for the use of native planting material in the commonly occurring mixtures in all situations where the present site conditions will at all justify such procedure. The oaks, hickories, tulip, walnut, etc. constitute the bulk of the native material to be used. There are a great many raw areas, however, including gully banks and steep washed lands where an attempt to establish a mixed

"All reproduction and undergrowth is eliminated by grazing—"

hardwood cover would undoubtedly lead to failure. It is, therefore, necessary to use such species as locust and the pines on many of these poorer sites. Even though these plantings may not prove highly successful in establishing forests of value, it is felt that they can be justified from an erosion standpoint and as the first step in the re-establishment of a permanent forest cover. Observations of past plantings, of locust in particular, indicates that a gradual transition to native hardwoods can be expected as the site becomes improved. In using pine, it is agreed that the species that will reproduce naturally should be favored. Quite a quantity of seed, including walnut, hickory, and oak was collected locally last fall and is now in stratification beds at the Soil Erosion Service Nursery on the Watershed. This will be used in direct seeding operations this spring.

Woods management is considered the most far reaching project as eventually all the original woods and the planted woods will, or should, come under good management. Using CCC crews, thinning, weeding, and sanitation cutting are being demonstrated. The development and many advantages of a selection woods are constantly emphasized. Fortunately, the

All aged stand—the result of conservative cutting and the exclusion of livestock.

selection type of woods is believed to be not only the best from an erosion control standpoint, but also the most profitable, in the long run, for the average farmer.

The possibilities of broader use of home grown forest products have been investigated and farmers are being encouraged through the educational program to use the material that they produce right at home in the farm woods, thereby reducing or entirely eliminating cash outlay for wood material needed on the farm.

Timber estimating and log scaling by the woods owner is being demonstrated in order that the former may know how

much timber he has to sell, thus enabling him to sell more intelligently to the timber buyers.

The advantages of the farmer doing his own logging are stressed. Not only can he make good wages for himself and team, but he can also better govern the logging operations in his woods. This undoubtedly means that the damage in logging can be kept at a minimum.

One of the most important phases of woods management and one of the most difficult to put into practice is the protection of the woods from grazing. With the present very serious sheet erosion situation in the farm woods, it is agreed among Soil Erosion Service workers that keeping stock out of the woods is a measure of far reaching importance. At first the farmers held out strongly against the idea of excluding stock from their own woods, but a great deal of progress has now been made. Practically all farmers under contract have agreed to fence out their woods.

Realizing the importance of keeping fire out of the woods because of the damage it does in destroying forest litter and in killing tree growth, the Forestry Division of the Soil Erosion Service in cooperation with the State Forestry Department has launched a fire control program. Fire control equipment of the most up to date design has been secured and fire fighting crews organized and trained in both the CCC camps that are working on the Watershed. Cooperation has then been extended to all farmers in and adjacent to the Watershed in controlling both building and forest fires. Many farmers readily accepted this cooperation last fall when fires became so prevalent.

Of the studies and observations that have been made those in the timber plot at the Soil Erosion Farm have proven of most interest. This is a plot of woodland of about 12 per cent slope and with a selection mixed oak woods cover. It has been neither grazed nor burned for many years. Cutting has been conservative. From a two and one-quarter acre plot established at the farm about one and one-half years ago that has to date been no loss of water or soil.

During August there occurred the first heavy rain following the very dry spring and summer. Prior to this rain the ground was extremely dry. The volume of rain was two and one-half inches and it all fell within a period of about three hours. Immediately afterward observations were made to determine the depth of penetration of this water in the timber plot and in adjacent fields with different types of cover, but all with comparable slopes. The penetration in the soil under the forest litter was about eight inches, in bare ground one and one-half, under a meadow cover five inches, under corn

about three inches, under heavy undisturbed sod about seven inches, and under wheat stubble about three inches.

During the past winter observations have been made to check the amount of soil freezing under different types of soil cover. As yet the soil under the timber has not been found frozen, even though at one time frost to a depth of over ten inches was found in bare soil just outside the plot. If during a normal winter in southeastern Ohio the soil under a woods litter remains open to absorb winter rains, surely the value of woods as a conserver of water and soil is greatly enhanced. It is felt that here is a subject that deserves further investigation.

In conducting educational work the demonstration is considered and used as the most effective method of teaching. For example, the objective is to establish farm woods improvement demonstrations on farms well distributed over the Watershed. In accomplishing this, interested cooperators are contacted and plans made for starting this work. CCC crews then go in and do the work under the close supervision of a forester and woods foreman. It is planned to cover only a part of each woods used, this part serving as a demonstration for the farmer and his neighbors in continuing the work.

Other educational work includes talks, articles for publication, and the preparation and distribution of circulars.

All of this educational work has been done in cooperation with the County Extension Agent, Mr. Barnhart.

In conducting this forestry work as part of a soil erosion control program this point has been borne constantly in mind, that this project is primarily a demonstration of practices that farmers in other communities can and will apply on their own farms. Therefore, it is essential that the demonstration be practical and that only those practices demonstrated that can be applied by the average farmer at low or no cost.

Very fine and helpful cooperation has been enjoyed with the Extension Service, with the Ohio State Forestry Division, with the Ohio Agricultural Experiment Station, with the Central States Forest Experiment Station at Columbus, and with the Soil Erosion Experiment Farm near Zanesville.